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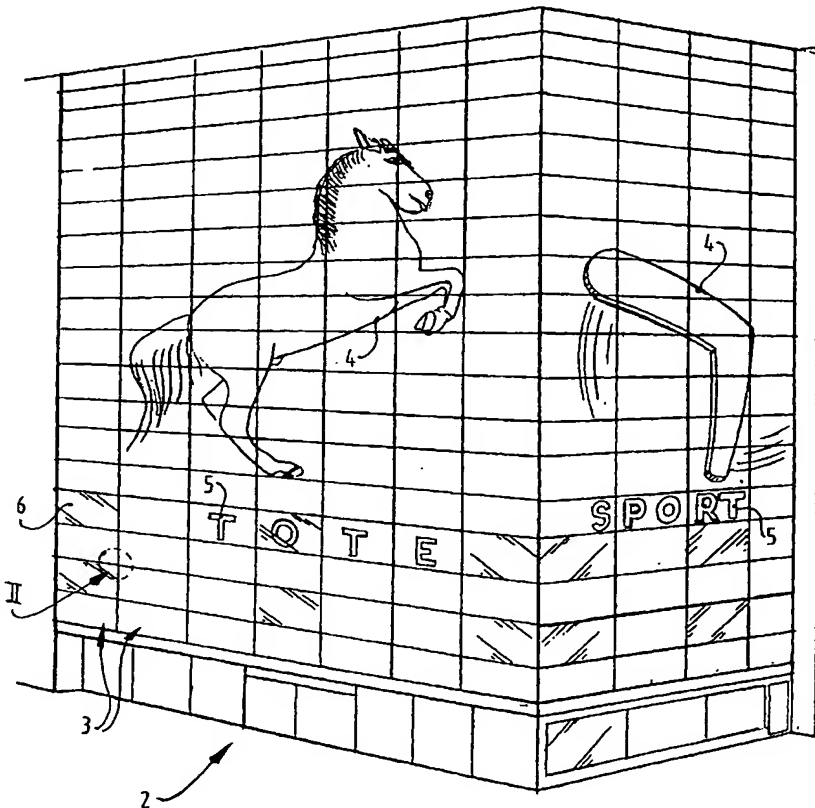
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(54) Title: **BUILDING WITH SANDWICH PANELS**

(57) Abstract: The invention relates to a building with a number of outside walls such as a frontage or roof which comprise a number of sandwich panels, wherein each sandwich panel comprises an outer and an inner plate-like element with a filler layer received therebetween, wherein the outer plate-like element of at least some sandwich panels carries a photovoltaic layer which is connected to an electrical system by connecting lines.

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

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BUILDING WITH SANDWICH PANELS

The invention relates to a building with a number of outside walls such as a frontage or roof which comprise a number of sandwich panels. Each sandwich panel comprises an outer and an inner plate-like element with a filler layer received therebetween. Such a sandwich panel has a supporting function in this frontage or this roof.

Buildings which are provided in outside walls with sandwich panels are generally known. Such a construction is frequently applied in office buildings in particular.

With the present trend toward a greater environmental awareness, and in particular a greater energy awareness, buildings are designed nowadays with explicit attention to the energy requirement.

In this respect the invention has for its object to provide a building of the type specified in the preamble which is embodied in particularly energy-saving manner.

This object is achieved according to the invention in that the outer plate-like element of at least some sandwich panels carries a photovoltaic layer which is connected to an electrical system by connecting lines. In this manner the large sandwich panelled areas are used effectively to generate photovoltaic electricity.

According to a preferred embodiment the outer plate-like element is transparent and the photovoltaic layer is arranged on the side of this plate-like element directed toward the filler layer. The light herein passes through the outer plate-like element and falls onto the photovoltaic layer arranged on the inner side thereof. This layer is therefore well protected against damage and deterioration due to unfavourable weather conditions and for instance damage during cleaning of an outside wall.

According to a further development the measure of claim 3 is applied. This decorative effect can be obtained by arranging the photovoltaic layer in a decorative pattern. This pattern can form a part of a

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pattern extending over a number of adjacent sandwich panels.

Another suitable embodiment is one wherein the photovoltaic layer is arranged in a decorative colour.

5 The frontage or the roof can thus be given a desired appropriate colour.

According to a favourable further development the photovoltaic layer is a layer of vapour-deposited amorphous silicon. In contrast to a crystalline layer,
10 such a layer has a homogenous appearance and is thus very suitable for decorative purposes.

The building according to the invention can further comprise a number of sandwich panels with an outer plate-like element which is free of a photovoltaic
15 layer. In this case only those sandwich panels having a suitable lighting are provided with an outer plate-like element with photovoltaic layer.

In this case the sandwich panels with a photovoltaic layer and those without a photovoltaic
20 layer are preferably further provided with the same dimensions, and the outer plate-like elements thereof comprise the same material. The outward difference in these panels can hereby be very limited, so that the outside wall in question can be given the desired
25 architectural appearance without this imposing limitations on the use of sandwich panels with photovoltaic layer.

The sandwich panels for the building according to the invention can further be varied with a view to
30 desired architectural or decorative effects. According to a further favourable development the sandwich panels without a photovoltaic layer can thus comprise a metal outer plate-like element. Sandwich panels with a glass
35 outer layer, whether or not they are provided with a photovoltaic layer, can in this manner be alternated with sandwich panels with a metal outer plate-like element.

In addition to the above stated advantages, the use of a photovoltaic layer of vapour-deposited amorphous
40 silicon has the advantage that the output of a thus

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manufactured solar panel is not dependent on the temperature, or hardly so. When the photovoltaic layer of vapour-deposited amorphous silicon is arranged on the inner side of the outer plate-like element and the
5 filler layer comprises thermal insulation material, the temperature of the photovoltaic layer can rise considerably in the case of direct solar irradiation. However, in a suitable embodiment of the photovoltaic layer, this does not then influence the output of
10 electrical power.

The invention will be further elucidated in the following description with reference to the annexed figures.

Figure 1 shows a perspective view of a building
15 according to the invention.

Figure 2 shows a partly broken-away perspective view according to arrow II in figure 1.

The building 2 shown in figure 1 comprises a number of outside walls two frontages of which can be seen in
20 the figure. Each of these frontages comprises a number of sandwich panels 3 which, as figure 2 shows in more detail, comprise an outer plate-like member 12 and an inner plate-like member 11. A filler layer 16 is received between these plate-like elements 11, 12. Both
25 plate-like members 11 and 12 are thin compared to filler layer 16. These are completely glued over their whole surface to the intermediate layer which has the structural function of fixing the two plate-like members at a mutual distance and exchanging between the plate-
30 like members shearing forces caused by load. Sandwich panels 3 can therefore readily absorb loads on the construction. In order to obtain a strong supporting construction element, profiles are incorporated in the edges of the panel which simultaneously serve for
35 mounting of the panels in the building structure.

According to the invention the outer plate-like element 12 is provided with a photovoltaic layer.

In the preferred embodiment shown here, the outer plate-like element 12 is a transparent sheet of glass 13
40 which is provided on its side directed toward filler

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layer 16 with photovoltaic layer 14. This photovoltaic layer 14 is connected to an electrical system by means of a schematically designated connecting line 15.

Because sandwich panels 3 are provided with this photovoltaic layer 14 they form solar panels which, when light falls thereon, generate electricity which can be used in the building 2 itself or which, after suitable conversion, can be supplied to the mains electricity grid.

Particularly because the photovoltaic layer 14 is vapour-deposited onto the sheet of glass 13, it is possible to arrange this layer in a decorative pattern. Graphic images 4 or lettering 5 can thus be integrated into the panels so that the outside walls remain completely flat in appearance and yet provide the desired information.

In addition to sandwich panels 3 with a photovoltaic layer 14 the building 2 likewise comprises window panes 6 which have the same dimensions as the sandwich panels and are therefore integrated into the surface of the outside wall. As shown in figure 2, these window panes are double glazed and arranged in a suitable window profile 15 which fits into the pattern of the sandwich panels.

As noted above, sandwich panels 3 are provided on their outer edge with an edge profile assembled from an edge profile 18 and an edge profile 19 which are mutually connected by plastic elements 20 in order to prevent the formation of thermal bridges.

These profile parts 18, 19 are formed such that connecting profile parts 26 can be fastened thereto by means of screws 27. These connecting profile parts 26 are alternately arranged on two adjacent sandwich panels and each secured using screws 28 in a profile 29 which is fixedly connected to an upright beam 10. It will be apparent that upright beams 10 are placed at intermediate distances corresponding to the horizontal dimension of the sandwich panels.

For finishing and protection purposes rubber seals 31 are received in the gaps between the adjacent

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sandwich panels. These rubber seals are arranged in a snap profile 30 which can be snapped fixedly onto connecting profile parts 26 after fitting of the sandwich panels. The horizontal gaps are finished in
5 corresponding manner with rubber seals 31 which are arranged on profiles 32, which are screwed to the underside of the relevant sandwich panels 3.

It is noted that the invention is not limited to the embodiments shown in the figures. In addition to
10 sandwich panels with a photovoltaic layer, sandwich panels without photovoltaic layer can also be applied in a building such as building 2. These may differ little or not at all from each other in appearance, so that the sandwich panels acting as solar panel are applied in
15 economic manner only at locations where they can catch sufficient light to enable economic use thereof.

Since in the preferred embodiment the photovoltaic layer 14 is arranged on the inner side of the sheets of glass 12, this layer is very well protected against
20 damage which could for instance occur during cleaning of the outside wall. Photovoltaic layer 14 is preferably a vapour-deposited amorphous silicon layer. This provides the sandwich panels with an attractive appearance which, as noted above, can also be used to form graphic images
25 as shown in figure 1 by a suitable decorative embodiment of the vapour-deposited layer.

The invention is however not limited to the use of vapour-deposited silicon layers on the inner side of a outer glass panel, but photovoltaic layers can also be
30 provided which are arranged against the outer surface of the sandwich panels.

All such variations are deemed as falling within the scope of the appended claims.

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CLAIMS

1. Building with a number of outside walls such as a frontage or roof which comprise a number of sandwich panels, wherein each sandwich panel comprises an outer and an inner plate-like element with a filler layer
5 received therebetween, wherein the outer plate-like element of at least some sandwich panels carries a photovoltaic layer which is connected to an electrical system by connecting lines.
2. Building as claimed in claim 1, wherein the
10 outer plate-like element is transparent and the photovoltaic layer is arranged on the side of this plate-like element directed toward the filler layer.
3. Building as claimed in claim 1 or 2, wherein the photovoltaic layer is arranged such that it has a
15 decorative effect.
4. Building as claimed in claim 3, wherein the photovoltaic layer is arranged in a decorative pattern.
5. Building as claimed in claim 3, wherein the photovoltaic layer is arranged in a decorative colour.
- 20 6. Building as claimed in any of the foregoing claims, wherein the photovoltaic layer comprises a layer of vapour-deposited amorphous silicon.
7. Building as claimed in claim 6, wherein the filler layer comprises thermal insulation material.
- 25 8. Building as claimed in any of the foregoing claims, further comprising a number of sandwich panels with an outer plate-like element which is free of a photovoltaic layer.
9. Building as claimed in claim 8, wherein the
30 sandwich panels with a photovoltaic layer and those without a photovoltaic layer have the same dimensions, and the outer plate-like elements thereof comprise the same material.
10. Building as claimed in claim 8 or 9, wherein
35 the sandwich panels without a photovoltaic layer comprise a metal outer plate-like element.

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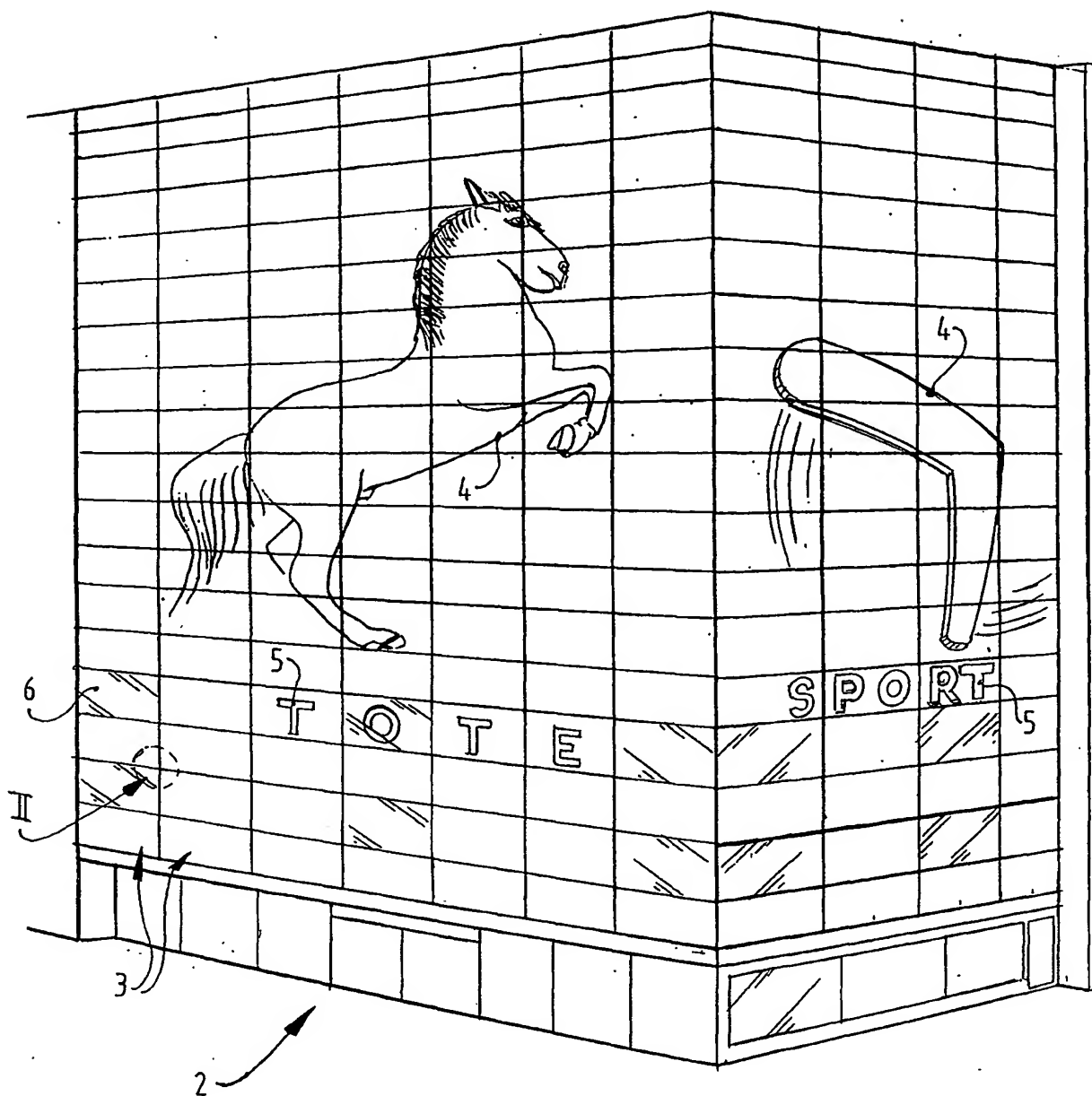
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11. Sandwich panel for a building as claimed in any of the foregoing claims.

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FIG.1

INTERNATIONAL SEARCH REPORT

Int'l Application No.
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A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H01L31/048 E04D13/18 E04B1/74 E04C2/54

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H01L E04B E04C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 39 43 516 A (KUNERT HEINZ) 29 November 1990 (1990-11-29) the whole document	1-4, 6-8, 11
X	J. LEPPÄNEN ET AL.: "Manufacturing options for large a-Si PV façade elements" 2ND WORLD CONFERENCE ON PHOTOVOLTAIC SOLAR ENERGY CONVERSION, vol. III, 6 - 10 July 1998, pages 2575-2578, XP002171487 VIENNA, AT the whole document	1, 2, 6, 7, 11
Y	---	2-4, 8-10
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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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- *E* earlier document but published on or after the international filing date
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- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Information on patent family members

In International Application No

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